

# Hybrid Solar Mill

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**Abstract:-** India is a developing nation where 80% of the people depend on non-renewable source of energy, for production of electricity. However, as the population grows, the demand of electricity will be high; as a result, the average Indian will pay a heavy amount of money for their power supply. And also for creating more production of electricity more fuels will be burn for example coal and natural gaseous etc, due to this their will be arises the problem of environmental pollution which effect the breath we intake became populated, and can be responsible for diseases. The system addresses the innovative idea of the renewable energy system in all energy production systems. By combining the two or more renewable energy production system for example solar system and wind turbine generator etc. by implementing this project, we can eliminate many problems related to shortage of electricity and resolves the difficulties in rapid climate changes by lessor generation of pollution, which helps in agriculture. The system runs on solar energy and wind energy, which is the one of the cleanest energy in the world. Renewable resources energy are very popular these days. The most common renewable source of energy is solar energy which is used to generate electricity. As part of our project, Renewable energy based solar panel and wind turbine combine system is developed for use and generate electricity. It is placed at a suitable height structure. The D.C motor has 120 rpm and is connected to the vertical axis turbine's bottom. The vertical axis wind's blade revolutions increased with the help of the wind. Solar panels are placed on these wind turbine blades, As wind turbines are exposed to sunlight, so sunrays can direct impact with solar panels, as a result the efficiency of the hybrid solar – wind turbine could be increased. The setup must be designed to maximize the net efficiency of the hybrid turbine while maintaining its

aerodynamic stability. The solar charge controller device are to control the flow of electric charge. And on the backside of solar panel air fins are attached for reducing the heat absorption by the sun, which are useful in increase of efficiency of solar panel. The system is like a vertical axis turbine with solar panels placed on the vertical wind blade. The system can be installed in the remote areas. These characteristics make the system ideal for generating electricity. The aim of the project is to design and develop blade of solar panel which follows the aerodynamically stability more effectively and solar panel which absorbs lessor heat compare to traditional panels. The system combines the two or more renewable energy resource for generation of electricity efficiently.

**Keywords:-** Solar Panel, Vertical Axis Turbine, Air Fins, Solar Energy, Wind Energy, Solar Charge Controller Etc.

## I. INTRODUCTION

This project focuses on the utilization of wind energy and solar energy as a renewable source combined. The aim of this major project is to design and implement a high efficiency of vertical axis wind turbine system that has the ability to work in both high and low wind speed conditions and solar panels have to reach at an efficiency of 18 – 20 %. They can be fixed anywhere – where the sunlight could reach the panels Therefore, the utilization of solar panels is relatively more straightforward. As wind turbines are exposed to sunlight – if solar panels are placed on these blades, the efficiency of the hybrid solar – wind turbine could be increased. The installation must be carried out in a manner that guarantees increased overall efficiency of the hybrid turbine while simultaneously maintaining its aerodynamic stability.



Fig 1 Working Model

## II. LITERATURE REVIEW

Table 1 Literature Review

S. No	Authors	Findings
1.	Ashish S.Ingole, Prof. Bhushan S. Rakhonde[2015] [1]	It is an environmentally-friendly option as it does not generate any emissions or harmful waste products like traditional energy sources. It is a cost-effective solution for power generation. A hybrid energy system combines two energy sources to provide electricity to the load.
2.	J.Godson, M.Karthick et.al [2013] [2]	By incorporating renewable energy sources such as solar, wind, biomass, hydro power, geothermal, and ocean resources, the hybrid energy system decreases reliance on a single source and enhances overall reliability. These technological options are regarded as viable solutions for generating clean energy.
3.	Mr.Sthita Prajna Mishra, Dr.S.M.Ali, et.al [2012] [3]	In simpler terms, the solar panel's energy collection increased by 68.5% when reflectors and tracking mechanisms were used alongside a single panel. Further energy obtained using the windmill with addition of dedicated altered design together adds to an increase in the efficiency by an overall margin of above 50%.
4.	Deshmukh and S.S Deshmukh[2006] [4]	Methods of modelling and designing hybrid renewable energy systems involve analysing available energy resources, using mathematical models and simulation tools,
5.	G.Thilak, S.Prabakaran, G.Sathi [2004] [5]	Design And Analysis of Savonius wind Turbine.

### ➤ These are the Project's Objectives:

The design of the hybrid solar mill will benefit Indian villagers on their remote location and in rural areas. It will lower the cost of electricity, and helps in keep environment clean by not burning any kind of fuel for light.

- This project's main goal is to design and implement a high efficiency of vertical axis wind turbine system that has the ability to operate at both high and low wind speed conditions and Solar Panels tends to have an efficiency of 18 – 20 % .
- To keep the price as low as possible so that everyone can afford it.
- All basic need of electricity can be completed by a single hybrid solar mill, to minimize pollution, and which will save money.
- The entire apparatus will run on nature's force solar and wind energy and be controlled by a solar charge controller. [4]

## III. PROBLEM STATEMENT

- *Low efficiency of turbine blade and solar panel*
- *Due to continuous changes in direction of wind and increase in temperature reduces efficiency of panel respectively.*
- *Extremely decrease efficiency up to 30%-to-40%, While in case of solar reduction in efficiency is very high and solar panel efficiency became less than 15%.*
- *User suffers with low power generation*

These are the key areas where our project will focus in order to reduce these issues. [4]

- *Idea to Solve Observed Problem: -*
- ✓ Use bearing at point of joint of blade to the shaft It helps in adjustment of blade according to wind direction.

- ✓ When we replace the wind blade with solar panel and due to wind, solar blade start motion which helps the panel to reduce its temperature.
- ✓ From these two ideas we can increase the efficiency of wind and solar power generation
- ✓ Use of bifacial solar blade is more beneficial for power generation at 45 degree.

**IV. METHODOLOGY**

Solar Energy is a way of producing electricity using photovoltaic systems which harness solar radiation emitted by the sun. These solar arrays or panels are simple to install and attached to structures and objects . These are typically installed on the ground and require a significant area of land to produce electricity on the magnitude of MW. By incorporating a solar panel onto the turbine blade, not only will the turbine's power output be enhanced, but it will also eliminate the need for additional space. The efficiency of the energy produced by solar panels is affected by the type of solar cell employed and the angle at which it is installed. The angle at which the solar panels must be installed is determined by the location's longitude. The attached solar panel must be as light as possible, if larger the mass, the lower the wind turbine efficiency. This is modify Savonius turbine can generate electricity by harnessing both the kinetic energy of the wind & the solar energy of the sun through solar panels installed on the rotor blades. These turbines are especially useful in areas with the fluctuation in wind energy and frequent changes its wind direction. The amount of net energy produced per wind turbine can be enhanced in this way. Put simply, even when there is no wind or very little wind, solar panels and photovoltaic cells can still generate energy for turbines. This means that the turbines can be more efficient overall since they can harness both wind and solar power.

➤ *Proposed Methodology:* -

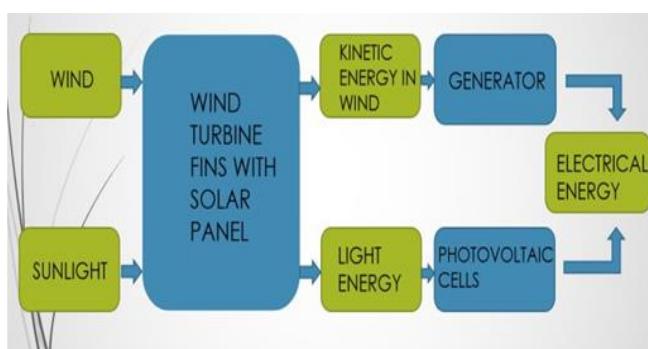


Fig 2 Block Diagram

**V. WORKING**

This system is fully operated by flow of wind and solar but charges are control by solar charge controller which is also an automatic device no need of any manual control. Hybrid solar mill is designed and constructed as renewable energy source combination multipurpose used in generation of electricity. It uses solar and wind energy for the production of electricity. [3]

- The system is a combination of solar and wind power for making electricity, when the direction of air changes then, using of bearing at point of joint of blade to the shaft It helps in adjustment of blade according to wind direction.
- As we replace the wind blade with solar panel and due to wind, solar blade start motion which helps the panel to reduce its temperature.
- Because of air fins attach with the backside of panel blade which increase its surface area for removal of heat.
- Due to this panels efficiency increases.
- And a D.C motor is connected at the bottom of the vertical axis turbine, which converts mechanical energy into electrical energy.
- And solar charge controller helps in collecting the charge to the battery and it is also preventing charges from flow in reverse direction.
- For power supply, we can use an inverter for D.C to A.C conversion.

**VI. VI PARTS TO BE USED**

Table 2 Used Equipment and Materials

S No.	Description	Quantity	Size	Price Approx.
1	D.C motor	1	2.5inch dia.	120
2	Solar panel	3	1x1.5 feet	2100
3	Battery	1	6x4inch 3inc thick	100
4	Wires	1	2meter	40
5	Inverter	1	4x4inch	700
6	Led bulb	1	2inch dia	100
7	Solar Charge Controller	1	6x4 inch	1200

A. *Components:* -

➤ *Dc Motor:* -

A DC motor is an electrical device that converts electrical energy into mechanical motion or rotational force. It operates using electromagnetic induction and consists of a stationary part called the stator and a rotating part known as the rotor. DC motors are widely used due to their simplicity, reliability, and controllability, finding applications in electric vehicles, robotics, industrial machinery, and more. RPM, which stands for revolutions per minute, is the measurement of a motor's speed. The gear assembly helps increase torque while reducing speed. The appropriate set of gears can be used to reduce the speed of a gear motor to any desired value. The concept behind gear reduction is that a vehicle can move more slowly while still creating more torque. This insight will go over every small and significant aspect that goes into creating the gear head and, in turn, the operation of the geared DC motor. [6]

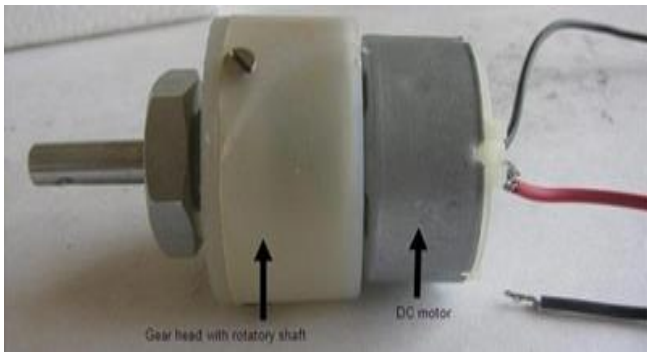


Fig 3 DC Motor

➤ **Solar Panel:-**

A solar panel, or photovoltaic (PV) module, is a collection of photovoltaic cells mounted on a framework for installation. Sunlight serves as the energy source for solar panels, which use it to generate direct current power. A group of PV modules is referred to as a PV panel, while a system of PV panels is referred to as an array. Solar electricity is used to power electrical equipment through photovoltaic arrays.[7]

Wires, typically in the form of wire rope, carry mechanical weights. In the context of electricity and telecommunications signals, "wire" can refer to an electrical cable. The "solid core" of this kind of cable might be formed of a single wire or several strands that have been braided or stranded together.

Although wire often has a cylindrical shape, it can also have different cross-sections, such as square, hexagonal, flattened rectangular, or other shapes, for both decorative and practical purposes, such as high-efficiency voice coils in loudspeakers. Specially flattened wire is used to create edge-wound coil springs like those found in Slinky toys.



Fig 4 Solar Panel

➤ **Battery:-**

An electrochemical oxidation-reduction (redox) cycle is used by batteries to convert the chemical energy contained in their active components directly into electric energy. In this type of reaction, electrons are transferred from one material to another using an electric circuit. [6]

The two primary battery types are determined by the characteristics of the cell, so let's go on. Primary and secondary batteries are two categories of batteries. The secondary one can be recharged, but the primary one cannot.



Fig 5 Battery

➤ **Wires:-**

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Fig 6 Wires

➤ **Inverter:-**

An inverter converts direct current (DC) power into alternating current (AC) power. It involves stages of rectification, filtering, inversion using semiconductor devices, pulse width modulation (PWM), and output filtering to provide clean AC power to the load.



Fig 7 Inverter

➤ *Led Lamps-*

LED lamps are highly energy-efficient, long-lasting light sources that have revolutionized the lighting industry. They consume less energy, have a longer lifespan, provide instant illumination, and offer precise control over direction and intensity. LED lamps contribute to sustainability, cost savings, and improved lighting experiences.



Fig 8 Led Bulb

➤ *Solar Charge Controller-*

A solar charge controller is a device that regulates the charging process of batteries in a solar power system. It prevents overcharging and deep discharging, ensuring efficient and safe battery charging.

PWM charge controllers are cost-effective and suitable for smaller systems, while MPPT charge controllers are more efficient and capable of extracting maximum power from the solar panels, making them ideal for larger systems or situations with varying weather conditions.

In summary, a solar charge controller plays a crucial role in managing the charging process of batteries in a solar power system. It safeguards the battery, optimizes charging efficiency, and ensures the reliable operation of the entire solar power system.



Fig 9 Solar Charge Controller

**VII. CONCLUSION**

- We can solve the remote location energy crises by the implementation of the project.
- If we manufacture this project and by implementation of this system our dependency on coal and petroleum product shall be decreases, which is helpful for better environment.
- By implementation of this project lots of money can be also save per year.

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**FUTURE SCOPE**

- In future work there is a need to be design blade of solar panel which follows the aerodynamically stability more effectively.
- to design and implement a high efficiency of vertical axis wind turbine system that has the ability to operate in both high and low wind speed conditions.
- In future work there is a need to be design solar panel which absorbs lessor heat compare to traditional panels.
- It will take the place of the outdated non-renewable source for production of huge energy.
- It can be used in future engineering project.

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